WELL INFORMATION DATA STANDARD

Standard No.:1-XXX

Version 1 –DRAFT

January 6, 2006

This document is a Working Draft that must be considered as "work in progress." It has not reached the stage of submission to the Environmental Data Standards Council

The Environmental Data Standards Council (EDSC) is a partnership among US EPA, States and Tribal partners to promote the efficient sharing of environmental information through the development and adoption of data standards. More information about the EDSC is available at www.envdatastandards.net.

Foreword

The Environmental Data Standards Council (EDSC) is a partnership among US EPA, States and Tribal partners to develop and agree upon data standards for environmental information collection and exchange. The Council seeks to promote efficient sharing of environmental information between State, US EPA and Tribal partners through the development of data standards. More information about the EDSC is available on the EDSC website at http://www.envdatastandards.net/.

1.0 INTRODUCTION

Environmental information is a key tool in the effective management of our environmental resources and human health conditions. As a result, much effort goes into data acquisition, management, maintenance, exchange, and oversight. Greater access is the goal of many data consumers, and data managers. Providers invest significant resources meeting their requirements. In response, many data providers are improving access as they post usable copies of their environmental information on the web. These efforts are a vast improvement over previous conditions; however, there is a growing desire and need to both provide and receive data in a clearly defined and a uniform way. Data from multiple sources can then be aggregated and used without the inherent variations that exist between data sets across agencies.

1.1 Scope

This EDSC standard describes data elements and data groupings that are used to exchange information about wells and is a supplement to the ESAR: Monitoring Location [EX000003.1] Data Standard when well information is being exchanged. It includes information about well ownership, location, use, construction, and where samples or measurements are made. The user may find that the information here can be very detailed, however, it should be noted that it provides structure for those data that are available and there is need to exchange.

1.2 Revision History

Date	Version	Description
January 6, 2006	Draft Standard	The Environmental Data Standards Council agreed to recommend that the Exchange Network Leadership Council publish draft standard in the Federal Register.

1.3 References

This standard relies on other standards to make it complete and provide the necessary support. As such users should consider the Normative Standards (references) noted below, integral to the Well Information Data Standard. These include:

- ESAR: Measure [EX000010.1] Data Standard
- Attached Binary Object [EX000006.1] Data Standard
- ESAR: Monitoring Location [EX000003.1] Data Standard

- Bibliographic Reference [EX000007.1] Data Standard
- Contact Information [EX000019.2] Data Standard
- Representation of Date and Time [EX000013.1] Data Standard

1.4 Terms and Definitions

None.

1.5 Implementation

Users are encouraged to use the XML registry housed on the Exchange Network Web site (http://www.exchangenetwork.net) to download schema components for the construction of XML schema flows. In addition, the Environmental Data Registry (http://www.epa.gov/edr) provides the data standard structure and attributes in a downloadable format that will facilitate database development activities.

1.6 Document Structure

The structure of this document is briefly described below:

a. Section 2.0 Well Information Diagram, illustrates the principal data groupings contained within Well Information Data Standard.

b. Section 3.0 Well Information Data Standards Table, provides information on the high and intermediate levels of Well Information data groupings, as well as their related data elements. Where applicable, for each level of this data standard, a definition, XML tag, note(s), example list of values and format are provided. The format column lists the required number of characters for the associated data element, where “A” specifies alphanumeric, “N” designates numeric, “G” is used for grouping and “D” for time and date elements.

c. Data Element Numbering. For purposes of clarity and to enhance understanding of data standard hierarchy and relationships, each data group is numerically classified from the primary to the elemental level.

d. Code and Identifier Metadata: Metadata, defined here as data about data or data elements, includes their descriptions and/or any needed context setting information required to identify the origin, conditions of use, interpretation, or understanding the information being exchanged or transferred. (Adapted from ISO/IEC 2382-17:1999 Information Technology Vocabulary—Part 17: Databases 17.06.05 metadata). Based on the business need, additional metadata may be required to sufficiently describe an identifier or a code. A note regarding this additional metadata is included in the notes column for identifier and code elements. Additional metadata for identifiers may include:

    • Identifier Context, which identifies the source or data system that created or defined the identifier

    Additional metadata for codes may include:

    • Code List Identifier, which is a standardized reference to the context or source of the set of codes

    • Code List Version Identifier, which identifies the particular version of the set of codes.

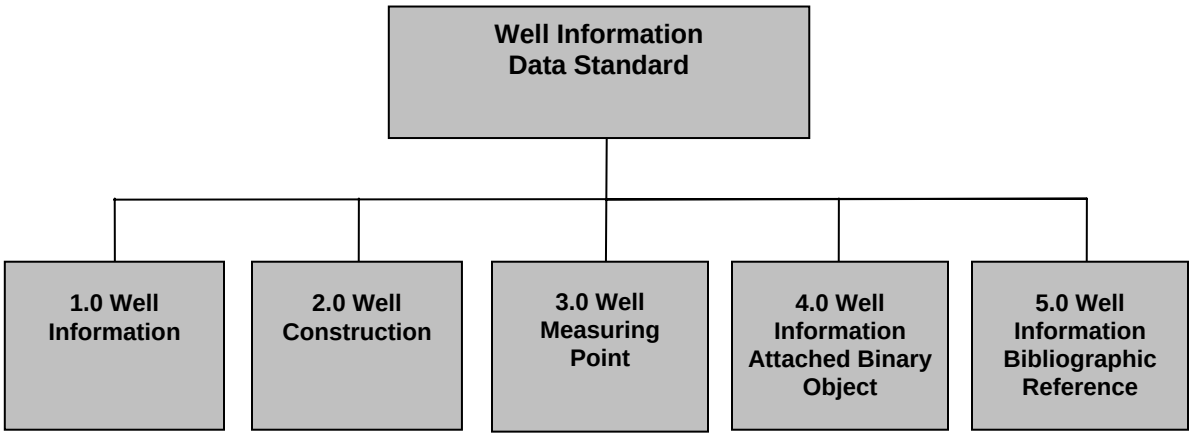
    • Code List Version Agency Identifier, which identifies the agency responsible for maintaining the set of codes

    • Code List Name, which describes the corresponding name for which the code represents

e. Appendix A, Well Information Data Structure Diagram illustrates the hierarchical classification of the Well Information data standard. This diagram enables business and technical users of this standard to quickly understand its general content and complexity. Appendix B, lists the references for Well Information Data Standard.

2.0 WELL INFORMATION DIAGRAM

The figure below illustrates the major data groups associated with the Well Information Data Standard.



3.0 WELL INFORMATION DATA STANDARD TABLE

1.0 Well Identification

Definition: Description of the attributes of a well that may be used for monitoring activities. The following elements provide information pertinent to well stations.

Relationships: None.

Notes: None.

XML Tag: WellIdentification

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
1.1 Well Identifier	Unique identifier assigned to the individual well (not a cluster of wells) by the monitoring or other accepted authority, for example, the well tag number or Inventory Record.	Multiple values may be allowed. Example List of Values: • Asotin 2478 • 200519965 • 9374847 • Well ID 3624 *Note:* Based on the business need, additional metadata may be required to sufficiently describe an identifier. This additional metadata is described in the Introduction section 1.6.d.	A	WellIdentifier

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
1.2 Well Cluster Identifier	For a Well Location with multiple wells or completions, a user-assigned number that uniquely identifies each well or completion.	*Note:* Required for a Well Location with multiple wells or completions, unless each well or completion has a separate Well Identifier. Example List of Values: • 1 • 2 • 32a • 32b *Note:* Based on the business need, additional metadata may be required to sufficiently describe an identifier. This additional metadata is described in the Introduction section 1.6.d.	A	WellClusterIdentifier
1.3 Well Name	The name that designates the well.	Example List of Values: • MW-32 • A.W. Johnson Well	A	WellName
1.4 Well Name Start Date	Date the name was first associated with the well.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellNameStartDate
1.5 Well Name End Date	Date the name was last associated with the well.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellNameEndDate
1.6 Well Owner	Identifies the organization or person who owns or owned the well.	Refer to the **Contact Information [EX000019.2] Data Standard**. The following items may be needed: Individual Full Name Organization Formal Name	G	WellOwner

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
1.7 Well Owner Contact	Identifies the contact information for the organization or person who owns or owned the well.	Refer to the **Contact Information [EX000019.2] Data Standard**. The following items may be needed: Individual Full Name Organization Formal Name	G	WellOwnerContact
1.8 Well Owner Start Date	Date the owner was first associated with the well.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellOwnerStartDate
1.9 Well Owner End Date	Date the owner was last associated with the well.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellOwnerEndDate
1.10 Land Owner Name	Identifies the organization or person who owns the land where the well is located.	This data grouping will repeat for each well owner.	A	LandOwnerName
1.11 Land Owner Contact	Identifies the contact information for the organization or person who owns the land where the well is located.	Refer to the **Contact Information [EX000019.2] Data Standard**. The following items may be needed: Individual Full Name Organization Formal Name	G	LandOwnerContact
1.12 Land Owner Start Date	Date the owner was first associated with the land where the well is located.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	LandOwnerStartDate
1.13 Land Owner End Date	Date the owner was last associated with the land where the well is located.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	LandOwnerEndDate
1.14 Well Operator Name	Identifies the organization or person who operates the well.	This data grouping will repeat for each well operator.	A	WellOperatorName

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
1.15 Well Operator Contact	Identifies the contact information for the organization or person who operates the well.	Refer to the **Contact Information [EX000019.2] Data Standard**. The following items may be needed: Individual Full Name Organization Formal Name	G	WellOperator Contact
1.16 Well Operator Start Date	Date the operator was first associated with the well.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellOperator StartDate
1.17 Well Operator End Date	Date the operator was last associated with the well.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellOperator EndDate
1.18 Well Status Text	Identifies the condition or status of the well being monitored.	This data grouping will repeat for each well status. Example List of Values: • Abandoned • Active • Decommissioned • In Need of Repair	A	WellStatusText
1.19 Well Status Date	Date that the well status was determined.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellStatusDate

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
1.20 Well Use Text	Identifies primary use of the well.	Example List of Values: • Anode • Dewater • Drainage • Geothermal • Heat Reservoir • Injection • Monitoring • Observation • Oil and Gas Well • Recharge • Remediation • Repressurization • Seismic • Test Hole • Waste Disposal • Water Withdrawal • Water Quality Assessment • Soil Vapor Monitoring • Soil Vapor Extraction • Other	A	WellUseText

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
1.21 Well Water Use Text	Identifies the main use of water from a well.	Example List of Values: • Air Conditioning/Heating • Aquaculture • Bottling • Commercial • Desalination • Domestic Water Supply • Fire Fighting • Industrial • Irrigation • Livestock Watering • Medicinal • Mining • Monitoring • Power • Public Water Supply • Recreation • Unused • Other	A	WellWaterUseText

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
1.22 Well Measuring or Sampling Influences Text	Known or potential strong influences that could affect measurements or samples collected from the well over time.	*Note:* May include a nearby well that is pumping in the same water bearing zone. Example List of Values: • Tidal Changes • Surface Water Stage Changes in Source Area • Frost • Confined Aquifer • Semi-confined Aquifer • Unconfined Aquifer Vados Zone • Karst Terrain • Upgradient Impacts • Inhibited Well Flow • Adjacent Active Wells	A	WellMeasuringSamplingInfluencesText
1.23 Water Source Name	Name of the primary formation, soils unit, or aquifer in which the well is completed.	Example List of Values: • Marshall Sandstone	A	WaterSourceName
1.24 Aquifer Name	Name of the aquifer in which the well is completed.	Example List of Values: • Spokane Rathdrum Prairie Aquifer • Ogallala	A	AquiferName

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
1.25 Formation Type Text	Name of the primary formation or soils unit, in which the well is completed.	Example List of Values: • Glacial Till • Sandstone • Fractured Bedrock	A	FormationTypeText
1.26 Groundwater Administrative Areas/ Designations Text	Areas that have been established by governments for the purpose of administering or regulating the groundwater where the well is completed.		A	GroundwaterAdministrativeAreasDesignationsText
1.27 Wellhead Protection Area Name	Name of the Wellhead Protection Area where the well is located.	Example List of Values: • City of Grand Rapids Wellhead Protection Area • Spring Creek Wellhead Protection Area	A	WellHeadProtectionAreaName
1.28 Source Water Assessment Area Name	Name of the Source Water Assessment Area where the well is located.	Example List of Values: • City of Grand Rapids Source Water Assessment Area • City of Spokane Source Water Assessment Area	A	SourceWaterAssessmentAreaName

2.0 Well Construction

Definition: Characteristics of the well construction.
Relationships: None.
Notes: None.
XML Tag: WellConstruction

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.1 Well Construction Method Text	The method by which the well was constructed.	Example List of Values: • Air Percussion • Air Rotary • Bored/Augured • Cable Tool • Driven • Dug • Drive & Wash • Hydraulic Rotary • Jetted • Reverse Rotary • Trenching • Other	A	WellConstructionMethodText
2.2 Well Construction Start Date	Date the excavation began.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellConstructionStartDate
2.3 Well Construction End Date	Date that construction was completed on a well.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellConstructionEndDate

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.4 Well Completion Depth Measure	Depth below land surface datum (LSD) to which the well is completed.	*Note:* May be equal to or less than the Well Hole Depth. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellCompletionDepthMeasure
2.5 Well Hole Depth Measure	Depth below land surface datum (LSD) to the bottom of the hole on completion of drilling.	*Note:* Sometimes the depth is greater than the Well Completion Depth. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellHoleDepthMeasure
2.6 Well Casing Diameter Measure	Well casing diameter at the surface.	Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellCasingDiameterMeasure

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.7 Well Completion Method Text	The method of completion or the nature of the openings that allow water to enter the well.	Example List of Values and definitions: • **Infiltration Gallery** - intake occurs via horizontal conduit; • **Terminus** - intake occurs via bottom of casing; • **Open Hole** - most common in bedrock, uncased hole extends below the bottom of the casing; • **Perforated /Slotted** - intake occurs via perforations or slots in casing; • **Porous Concrete -** most common in shallow, dug wells; • **Sand Point** - narrow, shallow, driven well, usually in sands, also know as a drive or well point; • **Screened with Gravel Pack** - intake occurs via screen in perforated casing; • **Screened with Sand Pack** - intake occurs via screen in perforated casing; • **Walled** - or shored - most common in shallow, dug wells; • **Other** - use if none of the other categories fit; • **Unknown** - use if unknown.	A	WellCompletionMethodText

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.8 Well Development Method Text	The method by which the efficiency of the well was improved after it was constructed.	Example List of Values: • Airlift • Bail • Chemical Treatment • Jet • Surge Block • None	A	WellDevelopmentMethodText
2.9 Well Disinfected Indicator	An indicator specifying whether the well was disinfected at the time of completion or not.	List of Permitted Values: • Y – yes • N – no	A	WellDisinfectedIndicator
2.10 Well Aquifer Test Indicator	An indicator specifying whether an aquifer testing has been performed (does not include short tests performed by driller upon well completion).	List of Permitted Values: • Y – yes • N – no	A	WellAquiferTestIndicator
2.11 Well Construction Comment Text	Brief comments or other information about the construction of a well.		A	WellConstructionCommentText
2.12 Well Construction Information Source Text	The source of the information being exchanged.	Example List of Values: • Historical Public Records • Historical Field Notes • Current	A	WellConstructionInformationSourceText

2.13 Well Intervals

Definition: Well intervals are repeating items that are used to describe the well from the surface to the Well Hole Total Depth and/or Well Completion Depth. The interval types include Borehole, Casing, Opening, Fill, and Lithology. Use as many interval types and intervals for a well as necessary.

Relationships: None.
Notes: None.
XML Tag: WellIntervals

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.1 Well Interval Borehole Diameter Identifier	The identifier associated with the well borehole diameter interval being described and the unique well identifier that identifies the well.		A	WellIntervalBoreholeDiameterIdentifier
2.13.2 Well Interval Borehole Diameter Measure	Diameter of the borehole within a specific interval.	Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalBoreholeDiameterMeasure
2.13.3 Well Interval Borehole Diameter Depth to Top of Interval Measure	Distance from the land surface datum (LSD) to the top of the Well Interval being described.	*Note:* Measurements above LSD are reported as negative numbers; those below are positive. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalBoreholeDiameterDepthTopIntervalMeasure

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.4 Well Interval Borehole Diameter Depth to Bottom of Interval Measure	Distance from the land surface datum (LSD) to the bottom of the Well Interval being described.	*Note:* Measurements above LSD are reported as negative numbers; those below are positive. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalBoreholeDiameterDepthBottomIntervalMeasure
2.13.5 Well Interval Casing Description Identifier	The identifier associated with the well casing interval being described and the unique well ID identifier that identifies the well.		A	WellIntervalCasingIdentier

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.6 Well Interval Casing Material Type Name	Type of material from which the well casing is made.	Example List of Values: • Brass or Bronze • Brick • Concrete • Copper • Fiberglass • Iron - Galvanized • Iron - Wrought • Metal - other • Polymer - PVC • Polymer - other • Rock or Stone • Steel - Coated • Steel - Stainless • Steel - other • Teflon • Tile • Concrete • Wood • Other material • Unknown	A	WellIntervalCasingMaterialTypeName

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.7 Well Interval Casing Join Type Name	The way individual casing pieces are joined together.	Example List of Values: • Glued or Solvent-Welded • Locking Mechanism • Screwed • Stacked • Threaded • Welded - metal • Other • Unknown	A	WellIntervalCasingJoinTypeName
2.13.8 Well Interval Casing Inside Diameter Measure	The diameter of the inside of the Well Casing for a particular well.	Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalCasingInsideDiameterMeasure
2.13.9 Well Interval Casing Wall Thickness Measure	Thickness of the Well Casing within a particular Well Interval.	Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalCasingWallThicknessMeasure

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.10 Well Interval Casing Depth to Top of Interval Measure	Distance from the land surface datum (LSD) to the top of the Well Interval being described.	*Note:* Measurements above LSD are reported as negative numbers; those below are positive. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalCasingDepthTopIntervalMeasure
2.13.11 Well Interval Casing Depth to Bottom of Interval Measure	Distance from the land surface datum (LSD) to the bottom of the Well Interval being described.	*Note:* Measurements above LSD are reported as negative numbers; those below are positive. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalCasingDepthBottomIntervalMeasure
2.13.12 Well Interval Fill Information Identifier	The identifier associated with the fill interval being described and the unique well identifier that identifies the well.		A	WellIntervalFillInformationIdentier

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.13 Well Interval Fill Material Type Text	Identifies the type of material that fills the annular space for a particular Well Interval.	*Note:* Includes material used as a surface seal. Example List of Values: • Bentonite Grout (Chips, Granules, Pellets, Slurry) • Neat Cement Grout (Portland Cement and Water) • Clay - other • Concrete • Gravel • Packer • Puddling Clay (Well Cuttings and Bentonite) • Sand • Sand and Gravel • Well Cuttings • None • Other Material • Unknown	A	WellIntervalFillMaterialTypeText

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.14 Well Interval Fill Width Measure	Horizontal width of the Fill Material in the annular space.	*Note:* Can include a surface seal or gravel pack around a well screen. If not directly measurable, subtract the drill bit size from the casing out side diameter. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalFillWidthMeasure
2.13.15 Well Interval Fill Volume Measure	Volume of Fill for a particular Well Interval.	*Note:* Fill Volume equals the fill width times the fill height. In cubic feet, cubic meters, or cubic yards. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalFillVolumeMeasure
2.13.16 Well Interval Fill Depth to Top of Interval Measure	Distance from the land surface datum (LSD) to the top of the Well Interval being described.	*Note:* Measurements above LSD are reported as negative numbers; those below are positive. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalFillDepthTopIntervalMeasure

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.17 Well Interval Fill Depth to Bottom of Interval Measure	Distance from the land surface datum (LSD) to the bottom of the Well Interval being described.	*Note:* Measurements above LSD are reported as negative numbers; those below are positive. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalFillDepthBottomIntervalMeasure
2.13.18 Well Interval Opening Information Identifier	The identifier associated with the well interval opening being described and the unique well identifier that identifies the well.		A	WellIntervalOpeningInformationIdentifier

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.19 Well Interval Opening Type Text	Type of opening within a particular Well Interval.	*Note:* Openings are permeable portions of the Well Casing or lining. Example List of Values: • Fractured rock • Open-ended Casing • Open hole • Perforated Pipe • Porous Material • Undifferentiated • Screen - Continuous Slot or Wire-wound • Screen – Direct Push (e.g. Drive, Sand or Well Point) • Screen - Louver, Bridge Slot, or Shutter • Screen - Mesh • Screen – Pipe Base (Continuous Slot Jacket over Slotted Pipe Core) • Screen - Slotted Pipe • Unscreened • Screen Type - Unknown • Walled or Shored • Other • Unknown	A	WellIntervalOpeningTypeText

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.20 Well Interval Opening Material Type Text	Type of material from which the Well Interval Opening (screen or otherwise) is constructed.	Example List of Values: • Brass or Bronze • Concrete • Fiberglass • Iron - Galvanized • Iron - Wrought • Metal - other • Polymer - PVC • Polymer - other • Steel - Coated • Steel - Stainless • Steel - other • Tile • Concrete • Other Material • Unknown	A	WellIntervalOpeningMaterialTypeText
2.13.21 Well Interval Opening Description Text	Description that elaborates upon the Opening.	Example List of Values: • The wire-wound screen was telescoped into the casing with an inflatable packer.	A	WellIntervalOpeningDescriptionText

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.22 Well Interval Opening Join Type Text	The process used to join the casing with the opening interval.	Example List of Values: • Glued or Solvent-Welded • Locking Mechanism • Screwed • Stacked • Threaded • Welded - Metal • Other • Unknown	A	WellIntervalOpeningJoinTypeText
2.13.23 Well Interval Opening Mesh Size Measure	Measure of the mesh or screen size within a particular Well Interval Opening.	Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalOpeningMeshSizeMeasure
2.13.24 Well Interval Opening Width Measure	Width of an Opening within a particular Well Interval.	*Note:* An opening constitutes the short dimension for perforations or slots. Width of continuous-slot, wire-wound, or mesh screens falls under Well Interval Opening Mesh Size. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalOpeningWidthMeasure

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.25 Well Interval Opening Depth to Top of Interval Measure	Distance from the land surface datum (LSD) to the top of the Well Interval being described.	*Note:* Measurements above LSD are reported as negative numbers; those below are positive. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalOpeningDepthTopIntervalMeasure
2.13.26 Well Interval Opening Depth to Bottom of Interval Measure	Distance from the land surface datum (LSD) to the bottom of the Well Interval being described.	*Note:* Measurements above LSD are reported as negative numbers; those below are positive. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalOpeningDepthBottomIntervalMeasure
2.13.27 Well Interval Lithologic Unit Identifier	The identifier associated with the well lithologic interval being described and the unique well identifier that identifies the well.		A	WellIntervalLithologicUnitIdentifier

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.28 Well Interval Lithologic Unit USGS/USCS Code	Unique code assigned to a type of underground Lithologic Unit.	Example List of Values: • BLDR - Boulder • CL - Clays • GC - Gravels, Clayey *Note 1:* Lithologic Units may be a mixture of United States Geological Survey (4 characters) and Unified Soil Classification System (2 characters) codes. *Note 2:* Based on the business need, additional metadata may be required to sufficiently describe an identifier. This additional metadata is described in the Introduction section 1.6.d.	A	WellIntervalLithologicUnitUSGS/USCSCode
2.13.29 Well Interval Lithologic Unit Depth to Top of Interval Measure	Distance from the land surface datum (LSD) to the top of the Well Interval being described.	*Note:* Measurements above LSD are reported as negative numbers; those below are positive. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalLithologicUnitDepthTopIntervalMeasure

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
2.13.30 Well Interval Lithologic Unit Depth to Bottom of Interval Measure	Distance from the land surface datum (LSD) to the bottom of the Well Interval being described.	*Note:* Measurements above LSD are reported as negative numbers; those below are positive. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellIntervalLithologicUnitDepthBottomIntervalMeasure

3.0 Well Measuring Point

Definition: Characteristics of the well measuring point. The measuring point is the place from which the measurement is made.

Relationships: None.

Notes: While most wells only have one measuring point, some have two or more for various reasons. Sometimes an old measuring point can no longer be used and a new one must be established. Other times, different groups measuring the same well might establish their own measuring points.

XML Tag: WellMeasuringPoint

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
3. 1 Well Measuring Point Name	Name of the Well Measuring Point associated with the Well Measuring Point Description.	Example List of Values: • Measuring Point 1 • MP2	A	WellMeasuringPointName

Data Element Name	Data Element Definitions	Notes	Format	XML Tags
3. 2 Well Measuring Point Height Measure	Height above or below the land surface datum (LSD) of a well from which the measurement is taken.	*Note:* A measuring point below the Well Location LSD is preceded by a minus (-) sign, such as for a flush-mount well. Refer to the **Measure [EX000010.1] Data Standard.** The following items may be needed: Measure Value, Measure Unit Code,	G	WellMeasuringPointHeightMeasure
3.3 Well Measuring Point Description Text	Describes the point from which the measurement was taken.	Example List of Values: • Top of casing • Notch on north side	A	WellMeasuringPointDescriptionText
3.4 Well Measuring Point Effective Date	Date when a particular measuring point was first used.	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellMeasuringPointEffectiveDate
3.5 Well Measuring Point End Date	Date when a particular measuring point was abandoned	Refer to the **Representation of Date and Time [EX000013.1] Data Standard.**	D	WellMeasuringPointEndDate

4.0 Well Information Attached Binary Object

Definition: Refer to documents, images, maps, photos, laboratory materials, geospatial coverages, and other objects within the data submission that pertain to the laboratory analyses.

Relationships: None.

Notes: Refer to the **Attached Binary Object [EX000006.1] Data Standard**.

Multiple objects may be attached to data submission for the analyses included in the submission. Where a binary object is attached, both the type code and the title of the file must be provided. Attached Binary Object descriptors will adhere to the specified technical standards.

XML Tag: WellInformationAttachedBinaryObject

5.0 Well Information Bibliographic Reference

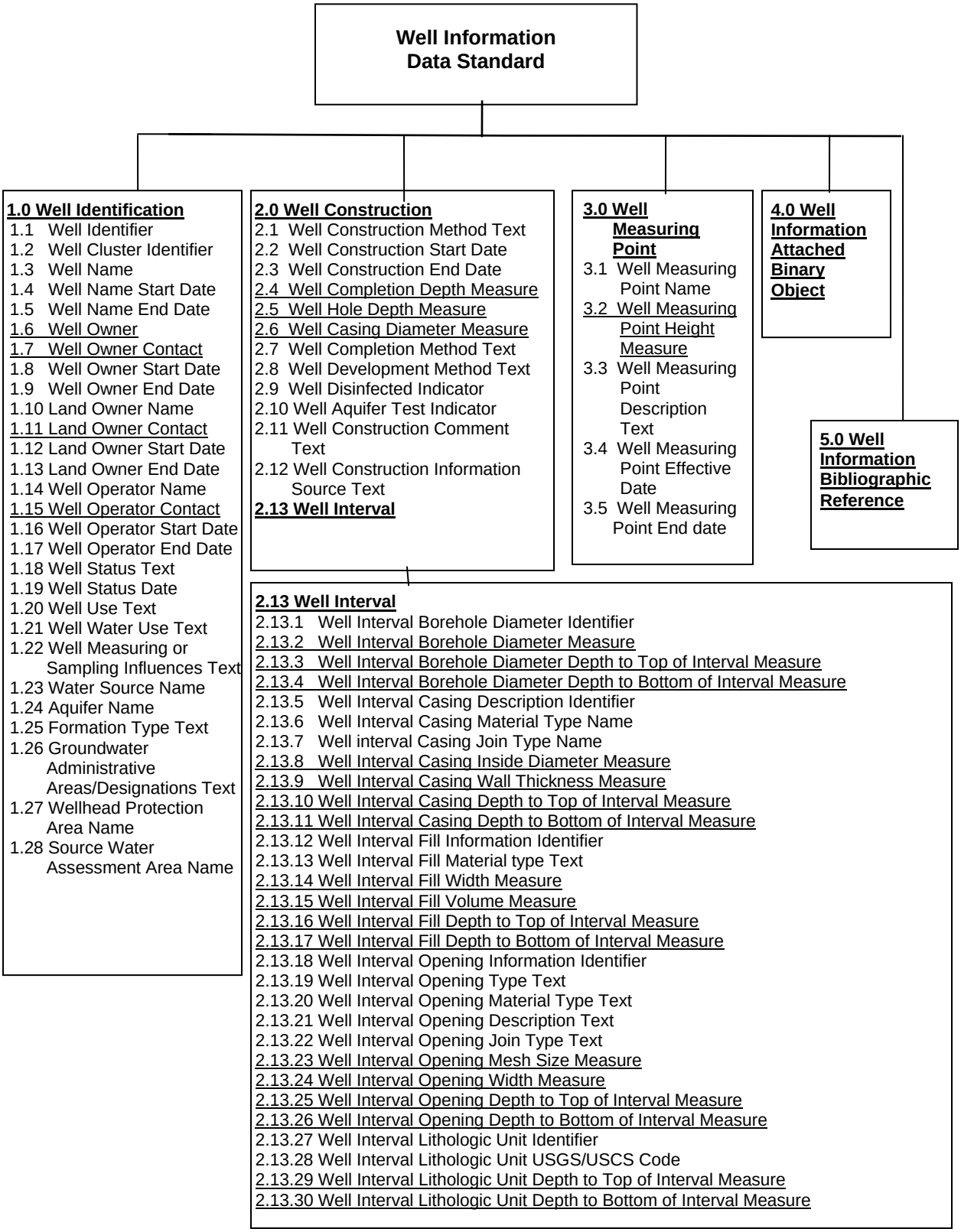
Definition: Catalog information describing associated project resources, including documents, images, maps, photos, laboratory materials, geospatial coverages and other objects.

Relationships: None.

Notes: Refer to the **Bibliographic Reference [EX000007.1] Data Standard.**

XML Tag: WellInformationBibliographicReference

Appendix A
Well Information Structure Diagram



Appendix B
References

1. See 40 CFR Parts 270.14(c)(5); 270.14(c)(6)(iv); 270.14(c)(7)(vi); and 264.97(d),(e) and (f) for Groundwater Monitoring Requirements at RCRA Facilities

2. USEPA 1989. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Interim Final Guidance* (EPA/530-SW-89-026), NTIS PB-89-151-047

3. Claasen, H. C. 1982. *Guidelines and Techniques for Obtaining Water Samples That Accurately Represent the Water Chemistry of an Aquifer*. U.S. Geological Survey, Open-File Report 82-1024, Lake Colorado, 49 pp

4. USEPA, 1989. Ground-*Water Monitoring in Karst Terrains, Recommended Protocols & Implicit Assumptions* ; USEPA EMSL (EPA/600/X-89/050) Las Vegas, NV http://www.epa.gov/swerust1/cat/gwkarst.pdf

5. Barcelona, M.J.; Gibb J.P; Helfrich, J.A; Garske, E.E.; 1985. *Practical Guide for Ground-Water Sampling*; Illinois State Water Survey Department of Energy and Natural Resources; U.S. Environmental Protection (Contract No. EPA CR-809966-01) Champaign, Illinois http://www.epa.gov/swerust1/cat/gwkarst.pdf

6. ISO/IEC 2382-17:1999 Information Technology Vocabulary—Part 17: Databases 17.06.05 metadata

7. See http://ngmdb.usgs.gov/Geolex/geolex_home.html for USGS Lithologic Units information

8. ASTM D2487-00 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System); ASTM International; 10 March 2000, 12pp